UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

March 28, 2013

Mr. Michael J. Pacilio
President and Chief Nuclear Officer
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3 - REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST FOR EXTENDED POWER UPRATE (TAC NOS. ME9631 AND ME9632)

Dear Mr. Pacilio:

By letter dated September 28, 2012, as supplemented on December 18, 2012, Exelon Generation Company, LLC (Exelon, the licensee) submitted a license amendment request for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. The proposed amendment would authorize an increase in the maximum power level from 3514 megawatts thermal (MWt) to 3951 MWt. The requested change, referred to as an extended power uprate (EPU), represents an increase of approximately 12.4 percent above the current licensed thermal power level.

The NRC staff is reviewing your submittal and has determined that additional information is needed to complete its review. The specific questions are found in the enclosed request for additional information (RAI). The RAI questions were provided in draft form to Mr. Kevin Borton of your staff via e-mail on March 20, 2013. The draft questions were sent to ensure that the questions were understandable, the regulatory basis for the questions was clear, and to determine if the information was previously docketed.

A conference call between the NRC staff and the Exelon staff was held on March 26, 2013, to discuss the questions. Following this call, Mr. Borton stated that Exelon would provide a response to the RAI by May 15, 2013. Please note that if you do not respond to this letter by the agreed-upon date or provide an acceptable alternate date in writing, we may reject your application for amendment under the provisions of Title 10 of the *Code of Federal Regulations*, Section 2.108.

If you have any questions, please contact me at (301) 415-1420.

Sincerely,

Richard B. Ennis, Senior Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-277 and 50-278

Enclosure:
Request for Additional Information

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REQUEST FOR ADDITIONAL INFORMATION

REGARDING PROPOSED LICENSE AMENDMENT

EXTENDED POWER UPRATE

PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3

DOCKET NOS. 50-277 AND 50-278

By letter dated September 28, 2012, as supplemented on December 18, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML122860201 and ML12312A443, respectively), Exelon Generation Company, LLC (Exelon, the licensee) submitted a license amendment request for Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. The proposed amendment would authorize an increase in the maximum power level from 3514 megawatts thermal (MWt) to 3951 MWt. The requested change, referred to as an extended power uprate (EPU), represents an increase of approximately 12.4 percent above the current licensed thermal power level.

The NRC staff is reviewing your submittal and has determined that additional information is needed to complete its review. The specific request for additional information (RAI) is addressed below.

Reactor Systems Branch (SRXB)
Reviewer: Diana Woodyatt

SRXB RAI-1

Background

On December 13, 2011, the NRC staff issued Information Notice (IN) 2011-21, "Realistic Emergency Core Cooling System Evaluation Model Effects Resulting from Nuclear Fuel Thermal Conductivity Degradation" (ADAMS Accession No. ML113430785). This IN addressed the potential for a phenomenon called thermal conductivity degradation (TCD) to cause errors (specifically higher peak cladding temperature (PCT)) in realistic emergency core cooling system (ECCS) evaluation models. IN 2009-23, "Nuclear Fuel Thermal Conductivity Degradation," dated October 9, 2009 (ADAMS Accession No. ML091550527), stated that pre-1999 methods may misrepresent fuel thermal conductivity and that calculated margins to specified acceptable fuel design limits and other limits may be less conservative than previously understood. On October 26, 2012, the NRC staff issued Supplement 1 to IN 2009-23 (ADAMS Accession No. ML121730336). This IN stated that safety analyses performed for reactors using methods that do not model TCD as a function of burnup may be less conservative than previously understood.

In a letter dated July 19, 2009 (ADAMS Accession No. ML083530224), the NRC staff issued a final safety evaluation (SE) for GE-Hitachi Nuclear Energy Americas LLC (GEH) licensing topical report (LTR) NEDC-33173P, "Applicability of General Electric Methods to Expanded

Operating Domains." Section 9.0, "Limitations and Conditions," item 12, of the NRC staff SE (ADAMS Accession No. ML091170541), stated that:

> In MFN 06-481, GE committed to submit plenum fission gas and fuel exposure gamma scans as part of the revision to the T-M [thermal mechanical] licensing process. The conclusions of the plenum fission gas and fuel exposure gamma scans of GE 10x10 fuel designs as operated will be submitted for NRC staff review and approval. This revision will be accomplished through Amendment to GESTAR II or in a T-M licensing LTR. PRIME (a newly developed T-M code) has been submitted to the NRC staff for review (Reference 58). Once the PRIME LTR and its application are approved, future license applications for EPU and MELLLA+ referencing LTR NEDC-33173P must utilize the PRIME T-M methods.

In a letter dated January 22, 2010 (ADAMS Accession No. ML100190258), the NRC staff approved three topical reports associated with the PRIME model for analysis of fuel rod thermal-mechanical performance.

In a letter to GEH dated March 23, 2012 (ADAMS Accession No. ML120680599), the NRC staff raised concerns regarding the use of historical fuel thermal conductivity models in the safety analyses of operating reactor plants. The letter cited concerns regarding TCD as stated in IN 2011-21. In addition, the letter requested that GEH inform all licensees using GEH evaluation models of any analytical changes that could affect the licensees' compliance with 10 CFR 50.46. GEH responded to the NRC's letter in a letter dated May 8, 2012 (ADAMS Accession No. ML12129A437). The GEH letter discussed the transition from the GSTRM model to the PRIME model to address the TCD issue.

Section 2.8.5.6.2.5, "Emergency Core Cooling System Performance," of Attachment 4 to the PBAPS EPU application dated September 28, 2012 (ADAMS Accession No. ML122860201), stated, in part, that:

> The EPU Licensing Basis PCT [peak cladding temperature] for GNF2 fuel is less than 1925°F, which represents an increase from the CLTP [current licensed thermal power] Licensing Basis PCT of less than 1870°F evaluated at CLTP power and rated core flow. The EPU Licensing Basis PCT incorporates the effects of all identified Evaluation Model changes and errors as noted by the 10 CFR 50.46 reporting process through notification letter 2011-03.

Section 2.8.5.6.2.5.2 and Table 1-1 in Attachment 4 to the application, indicate that the ECCS loss-of-coolant accident (LOCA) analysis was performed using the SAFER/GESTR-LOCA evaluation model. The SAFER/GESTR-LOCA model uses the GESTR-LOCA model for fuel rod thermal-mechanical performance and for the fuel temperature calculation. The GESTR-LOCA component of the SAFER/GESTR-LOCA evaluation model is based on the GSTRM fuel performance model, which does not account for the burnup-dependent effects of nuclear fuel TCD.

Based on recent discussions with the licensee, the NRC staff understands that, in November 2012, GEH notified Exelon of a change to the GEH ECCS-LOCA methodology for

PBAPS. Specifically, to address the TCD issue with respect to ECCS evaluation, GEH replaced the GESTR-LOCA model with the PRIME model. The NRC staff also understands that GEH's letter addressed the current licensing basis, as well as the proposed EPU conditions.

Exelon stated that, consistent with 10 CFR 50.46, since the change in PCT was less than 50 degrees F, the information would be submitted to the NRC with the annual 10 CFR 50.46 report in August 2013.

As noted above, the current EPU application is based on evaluation model changes and errors, as noted by the 10 CFR 50.46 reporting process, through a 2011 notification letter. The current EPU application and the supplement dated February 15, 2013, do not address the November 2012 notification letter from GEH to Exelon.

Issue

The licensee's safety analyses (including ECCS LOCA), supporting the proposed EPU, were performed using GSTRM based safety analysis methods that do not properly account for the effects of TCD. Methods that do not account for TCD may underpredict the fuel's calculated PCT.

Request

In order to properly evaluate the safety analyses, including ECCS-LOCA performance under EPU conditions, the NRC staff requests the licensee to provide information based on revised safety analyses, including ECCS-LOCA, that account for the effects of TCD. TCD is acceptably considered, for example, in the PRIME evaluation model.

This information should be sufficiently complete to allow the staff to determine whether ECCS cooling performance was calculated consistent with the requirements in 10 CFR 50.46(a)(1)(i). Specifically, as stated in this regulation, "ECCS cooling performance must be calculated in accordance with an acceptable evaluation model and must be calculated for a number of postulated loss-of-coolant accidents of different sizes, location, and other properties sufficient to provide assurance that the most severe loss-of-coolant accidents are calculated."

Detailed results should be provided for the most limiting case.

If you have any questions, please contact me at (301) 415-1420.

Sincerely,

/RA/

Richard B. Ennis, Senior Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

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